



The Global Nuclear Energy Partnership (GNEP)

Advanced Burner Reactors

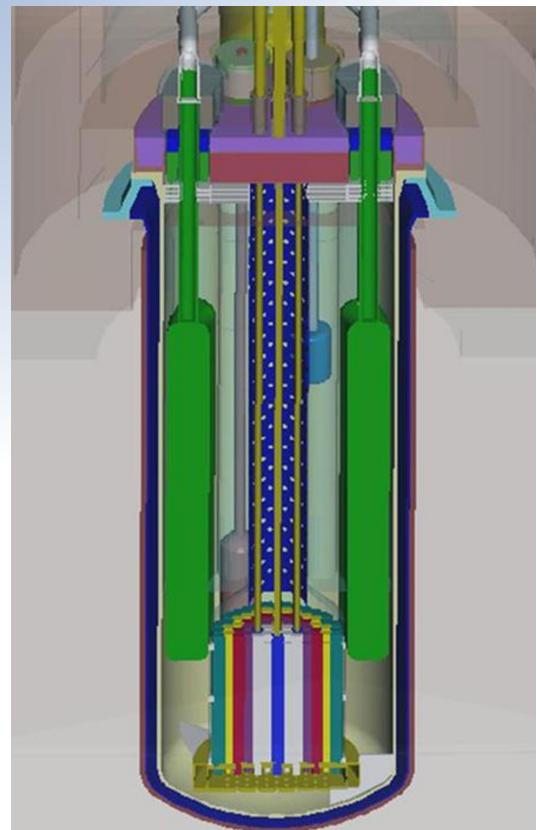
The Global Nuclear Energy Partnership (GNEP) will develop and demonstrate Advanced Burner Reactors, or advanced fast reactors, as a key element of a new, integrated U.S. recycling capability. As they produce power, advanced fast reactors consume transuranic elements (plutonium and other long-lived radioactive material), potentially eliminating the need for their disposal in the geologic repository at Yucca Mountain, Nevada.

As part of GNEP, the U.S. is moving from a once-through fuel cycle to an improved approach based on recycling of spent nuclear fuel. Specifically, recycling would comprise uranium extraction plus (UREX+).

Research has shown that UREX+ can separate uranium from spent fuel at a very high level of purification that would allow it to be recycled for re-enrichment, stored in an unshielded facility, or simply buried as a low-level waste. In addition, long-lived fission products, technetium and iodine, could be separated and immobilized for disposal in Yucca Mountain. Short-lived fission products, cesium and strontium, could be extracted and prepared for decay storage until they meet the requirements for disposal as low-level waste. Finally, transuranic elements (plutonium, neptunium, americium and curium) separated from the remaining fission products could be fabricated into fuel for an advanced fast reactor.

To develop and deploy an integrated recycling capability, the Department of Energy is investigating the feasibility, interest and ability of industry to

Continued next page



A concept diagram of an Advanced Burner Reactor

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Continued from previous page

collaborate with the U.S. national laboratories and international partners on both recycling and fast reactor technologies. Industry would participate in deployment of two facilities:

1. A recycling facility (the Consolidated Fuel Treatment Center) capable of separating the usable components contained in light water spent fuel from the waste products.
2. An advanced fast reactor, capable of consuming those usable products from the spent fuel while generating electricity.

U.S. national laboratories would design and direct the third component, the Advanced Fuel Cycle Facility, a modern state-of-the-art laboratory designed to serve reactor fuels research needs for the next 50 years.

The Department of Energy has issued two requests for Expressions of Interest from domestic and international industry regarding the feasibility of accelerating the development and deployment of the commercial-scale Consolidated Fuel Treatment Center and an advanced fast reactor.

Producing energy from waste

To destroy the transuranics in spent fuel from nuclear power plants, an advanced fast reactor takes advantage of high-energy or

fast neutrons to fission, or split apart, long-lived transuranics. The process transmutes transuranics into shorter-lived isotopes that do not require permanent, geologic disposal while releasing energy for electricity. The result is useful energy produced from material that would otherwise be waste.

Current light water reactors and advanced fast reactors would work well together in an advanced nuclear fuel cycle. Light water reactors are net producers of transuranics, while advanced fast reactors are net consumers of transuranics. The U.S. has a long and successful history of research in developing fast reactors, which provides a valuable base for their accelerated deployment in an integrated recycling capability. Fast reactors may be developed in modules to promote economical production and can be constructed at a single site to produce a plant capable of generating over a gigawatt of electricity.

Ensuring safety

Advanced fast reactors will incorporate safety and operational design features from the beginning to protect public and worker health while reducing greenhouse gas emissions during electricity generation. A key objective of the advanced fast reactor program is to obtain design certification from the U.S. Nuclear Regulatory Commission for a standard plant.

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